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Socio-Ecological Vulnerability in a Tibetan Village on the Mekong River, China

Brendan A. Galipeau

This work discusses pre-resettlement socioeconomic vulnerabilities to large hydropower dam construction as researched in a Tibetan village on the Mekong River in China's Yunnan Province. Utilizing a vulnerability framework that investigates/engages local knowledge, quantitative and qualitative ethnographic research discovered that prior to resettlement, villagers have developed a very unique economy, engaging themselves in commodity exchanges built upon the highly prized caterpillar fungus (*Ophiocordyceps sinensis*) and other forest products.

Government and private incentives given with the introduction of grapes and red wine have become equally important as cash-generating agriculture. All of these economic resources are shown to display significant vulnerability to future dam induced resettlement due to locale based access which will likely be lost. These findings point to an applied economic

development approach to resettlement and economic development in China's western minority regions. The article makes specific recommendations for enhanced local involvement and prior consultation in resettlement planning for hydropower dam construction.

Keywords: hydropower, vulnerability, local knowledge, resettlement, Tibetan people, China.

Introduction

In Southwest China's Yunnan Province, in the upper Mekong Basin, a series of large hydropower dams are currently being planned and constructed that threaten to displace tens of thousands of rural villagers for whom the prospects of resettlement present numerous livelihood complications. This case study of village level livelihoods highlights how such vulnerability to dam building in Southwest China presents itself, and generates a systematic methodology for looking at vulnerability in a broader context. In doing so, this article contributes to the emerging fields of research and theory in livelihood vulnerability and resilience in socio-ecological systems, a growing body of literature generating interest in political ecology among anthropologists and geographers (Forsyth 2003; Adger 2006; Jaffee 2007; Hall, Hirsch, and Li 2011). It also provides a picture of the socioeconomic challenges that highland minority groups in the Himalayan region, in this case Tibetans, may face under a scenario of dam-induced displacement.

Within policy debates, most vulnerability literature and particularly that written from a political ecology perspective, has called for more equitable representation of local marginalized populations (Forsyth 2003). Within this literature, more research is needed to explain where vulnerability to dams exists and how it is manifested. As scholars remind us, vulnerability also varies based upon the local context. In authoritarian situations like China, there is more vulnerability and less resilience on a local level due to the lack of ability for local communities to participate in planning processes, and in policy decisions about resettlement that directly affect them (McNally, Magee, and Wolf 2009). This article examines how livelihood vulnerability in a particular Tibetan village planned for resettlement in China presents itself along with the ways that it can be alleviated.

Background on Study Region and Hydrodevelopment

The construction of large dams is a major part of China's economic development strategies, and China is continuing with these projects at a rapid pace (Magee 2006). Hydropower currently supplies China with 16 percent of its total electricity, and with an economy that is highly reliant on coal-fired power plants, China sees hydropower as a valuable source of 'clean' energy (Rosen and Houser 2007). Hydropower in China's western regions, where the most potential is located on the Mekong, Salween, and Yangze rivers, is also a large part of a key national development strategy. The 'Great Western Opening' (*xibu da kaifa*), for example, is a policy meant to develop western China's remote and generally marginalized regions through large scale infrastructural development to reduce the sizable gap between China's western and eastern provinces.

A second goal of the strategy is to help solve what is known as the nationalities problem (Harrell 1995; Tilt 2010). Generally, China's minority nationalities, who inhabit the western regions, suffer from lower economic prosperity. The solution of the 'Great Western Opening' is to promote large scale infrastructure development and to harness the vast natural resources of the West and bring greater prosperity to minority peoples. However, the program utilizes a top down approach and doesn't take into account the opinions and knowledge of the primarily western minority communities which it is said to benefit (Tilt 2010).

Within the lower Mekong Basin in Yunnan, China has planned a cascade of seven dams, four of which are complete (Dore, Yu, and Li 2007; Magee 2011). Along the upper sections of the Mekong where this study is located, the government has plans for another cascade of dams, which will total five to eleven (Magee 2011). There is very little information published on the upper cascade, primarily due to the fact that the roads and other infrastructure needed to construct the projects have only recently been initiated (Magee 2011).

The Tibetan village where this research took place is located in the upper cascade, in Deqin County in Northwest Yunnan Province. Magee (2011) indicates that a large dam known as Gushui is planned here. If built, Gushui would become the tallest dam in the entire Mekong Basin. It will be built just downstream of the study village (hereafter referred to by the pseudonym of Geze) and will most certainly inundate the village if constructed (See Figure 1 for a map of the Mekong River with the study village's location).

Despite the potential for local economic growth touted by the government as stemming from the development of dams, the majority of the power that is generated by Yunnan's dams is actually transmitted East to supply China's eastern cities, providing few benefits to local inhabitants (Magee 2006; Dore, Yu, and Li 2007). What benefits are provided to local communities, in particular economic investments and direct monetary payments, are usually limited to provincial and lower level governments rather than rural villagers (Zhang, Liu, and Li 2008; Tilt, Braun, and He 2009).

In these situations, rural villagers themselves can end up suffering a variety of negative impacts. The affected communities, which in the case of the Yunnan's dam locations are often made up of minority groups, can suffer losses of land, resources, local ecological knowledge, and even social fragmentation (Chen 2008; Tilt, Braun, and He 2009). Their ability to prepare for these impacts is exacerbated by a lack of information provided to them regarding the possibility of resettlement (Zhang, Liu, and Li 2008). Zooming in on these issues, the research upon which this article is based



Figure 1. Map of Yunnan Province and its rivers with the location of Geze Village.

(Courtesy of Matthew Hartzell, 2014)

captures the vital economic activities that the Tibetan village of Geze faces while living in a modernizing world under an agricultural and forest product economy. I also wish to paint a picture of what the quality of life is today through the eyes of village residents, as well as the issues they face with a future of dam-induced resettlement as the government turns its eye to their section of the river to meet energy needs. A second empirical goal is to demonstrate the importance and effectiveness of an ethnographic approach to understanding displacement induced vulnerability in China specifically, and the ways in which the localized effects of dam-induced displacement on livelihoods can be missed in larger macro-level assessments taken from afar.

Methods

Research questions were developed to illuminate the local knowledge regarding natural resource use, collection, and economic importance within Geze that were/are at risk of being lost due to resettlement. Prior knowledge from previous visits to the region and background literature was also utilized to generate questions that specifically addressed

the natural resources and agricultural products used by villagers in order to prepare interviews that focused specifically upon the natural resources and economic products vital to local wellbeing and livelihoods.

The responses to these questions identified two resources that contribute significantly to the village economy. The first is caterpillar fungus (*Ophiocordyceps sinensis*), known in Tibetan as *yartsa gunbu* and in Chinese as *dong chong xia cao*. The second resource is grapes, a cash crop introduced by the government to promote red wine production in the region. This study was designed with the caterpillar fungus specifically in mind, given that it was known to be collected in the region and also something that has become highly commodified across rural Tibetan areas. In these regions it is collected and then sold at high prices often equivalent to its weight in gold and moved through various market structures into Chinese middle and upper class society. This regime of commodification, which Winkler terms the “fungal commodification of Tibet’s rural economy” (Winkler 2008a), has drastically improved rural livelihoods and wellbeing (monetarily) across Tibetan regions over the past

decade, though the universal benefits to rural villagers and the overall sustainability of the industry are in debate as competition over collecting grounds has continued to grow along with an increase in violent conflicts over such spaces (Lama 2007; Olsgard Stewart 2009; Roza Sulek 2009; Winkler 2008a, 2010). Given the overall effect and impact the caterpillar fungus has had on rural livelihoods and well-being, it is a worthwhile item of study to understand how resettlement might affect local access to such valuable and lucrative products.

Research Questions

The questions below guided a series of 20 qualitative household interviews, exploring a sense of place and importance with respect to the village's location and access to natural resources, and also informed quantitative questions to analyze the makeup of household incomes. In both cases major goals were to understand in what ways villagers are reliant and place importance on various natural resources for living a quality life (as they themselves defined it based upon an interview question), and how the village's location plays into this importance considering future plans for resettlement.

- 1) What is the state and composition of the resource based economy?
- 2) How important is the village's location to collecting caterpillar fungus and growing particular crops?
- 3) What are the economic impacts of displacement and resettlement if access to such resources is lost?

Research Process

Interviews took place over a month in fall of 2011 while living with one family in Geze, a village of 25 households. In addition to formal household interviews, large portions of information collected involved participant observation and unstructured interviews with villagers while interacting with them in daily activities. As Geze is an agricultural community directly tied to its local land and resources, my approach to participant observation involved taking part in several agricultural activities.

In doing so, the overall goal was to specifically be able to assess the village economy and by extension the vulnerability of these livelihoods to future resettlement. As Adger (2006) suggests, a combination of qualitative and quantitative data is well suited to vulnerability research because in addition to quantitative assessments, qualitative research and narratives can provide rich stakeholder and localized assessments that directly tie into a sense of place. Thus I designed interview questionnaires with an integrated approach,

including qualitative questions relating to natural resources and agricultural practices, as well as questions regarding people's perceptions on their quality of life, and economic development. Quantitative assessments involved scaled questions on the importance and significance of various commodities, to illuminate how the loss of access to such things from resettlement might make the village economy vulnerable. In total, 20 formal semi-structured household interviews were conducted.

Dams and Vulnerability in Social-Ecological Systems

In a review of socio-ecological vulnerability research, Eakin and Luers (2006) describe how with an interest in global environmental change during the 1990s, research on multiple types of vulnerability appeared. This research has diverged into three spheres of study: risk hazard assessments, political economy and ecology research, and ecological resilience assessments. With this divergence, full comprehensive analysis, particularly with respect to dams and the vulnerabilities they create, is difficult to locate. My research was conducted as a particular socioeconomic component of a greater project that is meant to provide just such analysis utilizing three pillars of measurement in assessing vulnerability to dams: socioeconomics, biophysics, and geopolitics (Brown et al. 2009; Tullos et al. 2010, 2013). The project described in these works was specifically initiated due to a call for more comprehensive analysis in understanding how multiple spheres of impact from dams can affect a human-environment system (World Commission on Dams 2000). In calling for comprehensive vulnerability research as the above works have sought to provide, Eakin and Luers (2006) also indicate that each of the different fields approaching vulnerability research characterizes vulnerability differently, though a general definition conveys an idea of susceptibility to damage or harm. The definition I find most useful is the one provided by Adger (2006), who defines vulnerability as "the state of susceptibility to harm from exposure to stresses associated with environmental and social change and from the absence of capacity to adapt" (268). He also highlights that vulnerability research has allowed a strong convergence of research fields because of its focus on social-ecological systems, and the idea that human actions and social ideals are an integral part of how nature functions. Good vulnerability research is also described by Adger (2006) as that which can highlight vulnerabilities in a socio-ecological system, and provide suggestions for better governance and adaptive action. As Eakin and Luers (2006) and Adger (2006) both suggest, vulnerability can fluctuate over time. As such, in this research I have captured through ethnography and quantitative assessment what the vulnerability to dam-induced displacement is at this explicit time for one community.

Results and Discussion

Daily Agricultural Life in Geze

Geze's villagers have traditionally been seasonal agropastoralists, growing crops and herding yaks and *dzo*¹ for their meat and dairy products, while also recently becoming heavily engaged in the collection and sale of non-timber forest products (Guo 2008). Traditionally each household raised anywhere from 10 to 15 yaks or *dzo* and primarily grew grains of wheat, barley, and more recently corn as animal feed and for household consumption. In recent years however, most homes (all but one) have limited their yak numbers to two or three and have chosen instead to focus their agriculture on grapes introduced approximately ten years ago by the government as a lucrative cash crop. These grapes are annually sold to the Shangri-La Red Wine Company, a partially private and government-subsidized venture that uses the recently renamed Shangri-La region to capitalize on marketing. In terms of forest product collection, which has also grown in importance for the household economy, the most important resource to villagers is caterpillar fungus, though other mushrooms and herbs, including the highly prized *matsutake* (Japanese) mushroom, which is collected and then quickly exported to Japan, are also valued and seasonally collected in the summer (Yeh 2000; Winkler 2008b; Menzies and Li 2012).

While villagers have filled the majority of their fields with grape vineyards in recent years, they also intercrop these vineyards with corn, wheat, barley, and a large variety of vegetables, all of which are still used for personal consumption and as animal feed. Walnut trees are also scattered

throughout the village, the nuts of which are harvested and both sold and consumed. Each family possesses one or two large trees in their fields, along with a new orchard that has been planted on a slope above the village in which each household will gain several more. Also grown throughout the village are a number of fruit trees used for personal consumption, including apple, pear, peach, and Sichuan pepper (*hua jiao*). Quite unlike the higher mountain areas, the bottom of the Mekong River valley where Geze is located is incredibly warm all year round, which, along with increased access to markets, is why the village can benefit from such a rich diversity of agriculture (Salick, Yongping, and Amend 2005; Moseley and Tang 2006). By their own definitions, Geze's villagers have a fairly good standard of living through agriculture and the harvest of forest products, which has also helped them to avoid having to look for work outside the village. In their own words, their village is overall better than others in the immediate area, especially due to the availability of caterpillar fungus.

Household Income

I provide a breakdown of the quantitative results showing what various commodities and other sources make up household incomes in Geze and what their percentages are out of total annual income. A pie chart is used in Figure 2 to contextualize total annual household incomes and to show the amount that natural resources and agricultural products each contribute. Caterpillar fungus and grapes make up the largest portions of each household's annual mean income at 10,775 RMB (30 percent) and 13,195 RMB (37 percent) respectively. All other sources combined (33 percent) would in total equal only slightly more than

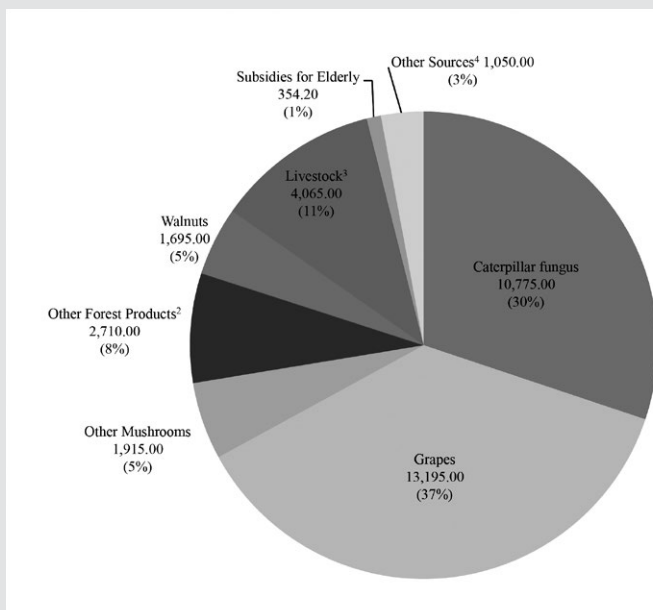


Figure 2. Mean and percent of total income sources in Geze¹

1. Sample size is 20 households, and means are in Chinese RMB; 1 U.S. dollar is approximately 6.1 RMB.
2. Only 9 of 20 households collected other forest products.
3. Only 7 of 20 households reported income from livestock.
4. Only 3 out of 20 households reported other sources.

Table 1. Primary sources of income by household response¹

Caterpillar fungus and grapes	Caterpillar fungus, other forest products, and grapes	Grapes	Other	Caterpillar fungus
12	3	2	3	1

1. The total sample size is 20 households. Twenty-one responses are indicated as some households described a mix of sources which were coded by theme separately.

caterpillar fungus and less than what is made from grapes. Current government statistics for Deqin County (where Geze is located) reporting income from agricultural communities only report grain produced, which certainly brings into question whether or not things like caterpillar fungus and grapes, being the village's highest income sources are ever considered for replacement in resettlement compensation.

Qualitative Results

Semi-structured interviews and interactions illustrate villagers' dependence upon various resources. These results show that Geze's economy is highly place-based and reliant on villagers' ability to take part in specific economic activities. Initially I asked a question about each household's primary or highest source of annual income. These responses based upon coded themes are outlined by frequency in Table 1.

By villagers' perceptions, grapes and caterpillar fungus are the most important sources of income. The three 'other' sources described included a pig farm, a village store selling local necessities, and remission from older children in one household whose sole residents were elderly. These additional income strategies may indeed be sound in the future compared to less stable sources.

Next a series of scaled questions were asked about caterpillar fungus, other forest products, and cash agriculture to determine how respondents individually rank the importance of such commodities. In asking these questions, qualitative responses regarding feelings towards the importance of each item discussed were also given in addition to a ranking of agreement. The scaled results of these questions for all three categories are outlined in Table 2, with each labeled as caterpillar fungus A, caterpillar fungus B, other forest products A, etc. No less than 70 percent of the households interviewed indicated that these natural resources and crops were both an important part of the economy and that the loss of these resources would be detrimental to wellbeing.

The qualitative responses on the importance of income sources the questions in Table 2 elicited were coded based upon theme. Eight households described caterpillar fungus as being a highly important income source, giving responses such as:

"It is a very important source of income. One person can collect 15,000 RMB's worth per year. Three people could get 45,000 RMB."

"If my family can't get caterpillar fungus we will have a big problem with our income and we won't be able to buy things for the New Year."

"Income and health are both important because of caterpillar fungus."

Four households provided additional assessments on other forest products, with various ideas around these resources including assessments that if one is not rich, such products can be as important as caterpillar fungus, but also that the prices of these things are not nearly as stable. When asked if other resources such as *matsutake* mushrooms, another huge commodity in Yunnan that is exported to Japan (Yang et al. 2008; Menzies and Li 2012), were as important as caterpillar fungus, 10 households (50 percent) stated yes and 10 (50 percent) stated no. However, when asked if any of these things were more important than caterpillar fungus, the responses were 14 no (70 percent), and only 6 yes (30 percent).

Nine households provided qualifying assessments of cash crops, with a primary theme being that grapes are more important as a source of income than walnuts. When asked if cash crops and grapes specifically were considered an important source of income, 19 households (95 percent) stated yes, with only one (5 percent) stating no. It was clear that as far as cash cropping is concerned, grapes are far more lucrative than walnuts.

In addition to agriculture and forest product collection, certain households in Geze participate in various other economic activities. In limited cases however, these are less integral to overall wellbeing. Some households were

Table 2. Scaled responses on the importance of various natural resource commodities¹

Question A: Please rate your agreement with the following statement: "Caterpillar fungus (or another resource) is a highly important part of my livelihood."
 Question B: Please rate your agreement with the following statement: "If I could not collect Caterpillar fungus (or another resource) my income and livelihood would be significantly lowered or depleted."

Question	Disagree	Neutral	Agree
Caterpillar Fungus A	0 (0%)	0 (0%)	20 (100%)
Caterpillar Fungus B	2 (10%)	0 (0%)	18 (90%)
Other Forest Products A	1 (5%)	5 (25%)	14 (70%)
Other Forest Products B	4 (20%)	2 (10%)	14 (70%)
Cash Crops A	1 (5%)	1 (5%)	18 (90%)
Cash Crops B	1 (5%)	4 (20%)	15 (75%)

1. Sample size is 20 households. Geze only contains 25 households and three were located at a distance away from the central village while two were not accessible for interviews due to illness or various relationship issues with other households with whom I was associated.

Table 3. Qualitative themes for good standard of living

Comforts (Beyond <i>Wenbao</i> ¹)	Food to Eat/ Meat at Every Meal	Good Clothing	Good Health	Having a Nice House	Having Good Income Resources	Higher Income
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1. A Chinese concept meaning essential warmth and fullness.

more entrepreneurial, which may come to benefit them. This was often due to surplus labor, or promotion of such activities by certain family members, especially educated children. For instance, the village leader owned a pig factory at the recommendation of his son who worked in local government. This man estimated that on average he made 55,000 RMB per year from pig sales. Similarly, my host family owned one of two village shops from which they made 7,500 RMB per year. These types of activities were limited to four or five families.

Villager perceptions of the importance of Geze's location directly related to the pursuit of various income strategies. One qualitative question asked of each household was to provide a description of what a good quality of life meant. Out of the 20 households interviewed, this produced seven prevalent themes highlighted in Table 3.

Of particular note are the ideas of having good income resources and having higher income. These and other themes, such as good clothing and good health, all tie back to having enough money to possess such things. With Geze's primary income sources being agriculture and caterpillar fungus collection, it is not difficult to imagine that access to these things would be important to attain a good standard of living. Having more money would indeed provide better food, including meat at every meal, and oth-

er additional comforts beyond these, as described by the first theme of comforts beyond *wenbao*, a Chinese concept describing essential warmth and fullness. This theme was exemplified by quotes such as the following:

"Children having money to buy biscuits at the store, young people being able to play mahjong."

"A higher level to all aspects of life."

With respect to the direct importance of natural resource commodities and Geze's locale, two highly relevant responses describing this ideal fell under the 'having good income resources' theme:

"To have grapes and caterpillar fungus is a good standard of living. Having walnuts is also good even though the income from them is lower because they can still help with having a good life."

"The mountain provides a good standard because most of our income comes from the mountain."

When asked to compare the standard of living in Geze with other regions, the most prevalent theme, given by 10 out of 20 households, was that Geze had a better standard of living than other villages in the same area. The primary reason for this is that Geze is located in close proximity to a mountain with many rich resources, including caterpil-

lar fungus, something the villagers are proud of as many villages in the area lack such favorable geography. Two respondents stated the following when asked to compare the standard of living:

“It is also better here than other villages in Deqin. This is the best village because we have the high mountain with lots of resources and if we work hard we can make lots of money from the mountains.”

“It is better than other rural places and other villages around here because we have so many resources. Other villages in this area must look for work outside the village.”

This second quote brought up a major point that villagers emphasized when they described the resources of Geze: they are not forced to look for outside labor to fulfill economic needs, specifically because they have caterpillar fungus.

As my host emphasized during an informal discussion one evening, most villages in Deqin County do not have access to high pastures where caterpillar fungus is found. Because of this, during the collecting season, Geze allows a neighboring village to share its collecting grounds but charges 100 RMB per person per month. Thus, not only do villagers directly benefit from being able to collect the fungus, but they also benefit from their possession of a collecting space. It is clear that Geze’s location has been highly beneficial both for its access to caterpillar fungus and other forest products, as well as its ability to participate in the government-introduced grape growing.

Vulnerabilities to Resettlement

Villager perceptions highlight the importance of agriculture and forest products in household economic strategies, as well as Geze’s location as a major part of this significance. What does this then mean with respect to whether loss of these income sources and resettlement would cause economic hardship? In the scaled questions highlighted in Table 2, a majority of households indicated that a loss of access to these various commodities would severely impact economic wellbeing.

As outlined in the Introduction, Geze lies shortly upstream of the potential site for the Gushui Dam (Magee 2011). This dam would flood out several communities from Geze to much further upstream. Geze’s proximity to caterpillar fungus and other forest products, as well as prime agricultural space for grape growing, are mere accidents of geography, yet so is the threat of being resettled. When the village is resettled, it will not likely be moved to a nearby location as flat cultivatable land is scarce in this region and

limited to small pockets in the valley bottom. The slopes immediately above the village and within any reasonable distance upstream or downstream would provide nowhere near the space that is currently available to or needed by villagers for their homes and farming.

Resettlement practices downstream on the Mekong indicate that it is unlikely Geze would be relocated to a nearby location that would allow it to keep its access to geographically limited resources such as caterpillar fungus. In these areas, communities have been moved to regions with different topography than those that they originally inhabited and have had to make economic and lifestyle changes. Alterations in cropping patterns and socio-ecological relationships, losses of ecological knowledge, and shifting away from agricultural income strategies to less secure forms of wage labor have all been observed (Zhang, Liu, and Li 2008; Tilt, Braun, and He 2009; Galipeau, Ingman, and Tilt 2013).

Since the economic reforms of the 1980s, when agricultural communes were ended and farming was turned over to individual households to choose to grow whatever crops they wished, land has been one of the most stable sources of social security and income (Tilt 2008). In Geze’s case, this not only refers to agricultural land, but forest land with caterpillar fungus and other resources as well, which is reduced in resettled households in the lower Mekong by an average of 11 *mu* (1 *mu* is approximately 1/6 of an acre) (Galipeau, Ingman, and Tilt 2013). If Geze was relocated out of the area, there would potentially be a huge loss when one looks at the economic productivity of caterpillar fungus and grapes, especially if similarly lucrative economic opportunities are not available post-resettlement.

Village perceptions and knowledge about this potential future of displacement to a dissimilar location with different income generation options are almost non-existent, and many government programs improving the village in its current location may be providing a false sense of security. When asked about future economic development planned for the region, only one household mentioned a dam being built and resettlement of the village. This respondent was from one of the richest households in the village, and indicated that his son was well connected with the government through a road construction company, which is how he was aware of the dam project. Any general knowledge of the dam and resettlement was however not widespread.

On the contrary, when asked to describe various infrastructural development projects in the village that had taken place and that were planned for the future, respondents described a variety of projects and events that give the impression there are plans to continue improving the

Table 4. Future development projects villagers described as promised by government

More Home Improvements
Building Roads to Crop Fields
Relocation for a Dam
New Walnut Orchard
Better Landslide Prevention
Building Toilets
Continued Income for the Elderly
Irrigation Canals
Sending more Children to School

village in its current location. A range of historical and planned projects were described and coded by theme, with all future projects described outlined in Table 4. Some of the most prevalent projects that have occurred recently include money between 8,000 and 10,000 RMB given out to every household for home improvements, walnut seedlings for each household, a new road, paved pathways throughout the village, and plans for irrigation canals. Worth noting is that while the new road seems great to villagers for better transportation and market access, it may in fact simply be an indicator of improving infrastructure for future dam construction.

Moving forward with projects such as those in Table 4 presents two issues: The first is that it may be creating a false sense of security over current landholdings, providing certain promises and provisions indicating that the government plans to continue helping to improve local infrastructure. Second, from the perspective of sound planning, continuing to spend money on such infrastructural projects beyond the building of the road (needed for dam construction) does not make sense fiscally. Why are large amounts of money targeted for economic improvement being used to improve a village that officials know will be inundated in the near future, and expectedly with the next decade? From a policy perspective, such money could be better used preparing the village for future settlement and to generate better economic resilience and recovery strategies.

As introduced in the section on Dams and Vulnerability, in 2006 the central government established a law that granted rights to people displaced by dams and said that the government has to be certain the standards of living of displaced people are not decreased, must remain the same, or be raised through subsidies and resettlement payments

(Central Government of the People's Republic of China 2006; Brown and Xu 2010). The law also stated that communities reliant on agriculture must be moved to areas where they can continue to practice agriculture and must be given equal amounts of land to what they previously possessed. All trees and seedlings inundated must be compensated for, and if subsidy and compensation payments cannot offset these losses, they must be increased until they do. New housing must also be provided of the same scale, standard, and function. Lastly, displaced people must be allowed to play a role in the decision-making regarding their resettlement (Central Government of the People's Republic of China 2006; Brown and Xu, 2010). Much of the literature however, suggests that the enforcement of this resettlement law is sporadic and uneven (Tilt, Braun, and He 2009; Brown and Xu 2010).

Many questions with respect to what Geze's future may look like are thus raised. Indeed, agricultural communities who are being resettled downstream on the Mekong since the law's passing appear to be receiving better subsidies from the government than communities resettled before 2006. However the subsidies that they are receiving are still minimal compared to other new income sources that must be sought out; primarily wage labor which is not nearly as stable as a means of social security compared to land (Galipeau, Ingman and Tilt 2013). Indeed most households surveyed during various studies in the lower Mekong (resettled after 2006), reported overall less agricultural income and land possessions, especially with respect to forest land (Chen 2008).

Geze's villagers do not have a good variety of income sources, which, based upon work with rural other communities in China, makes them vulnerable as a rural agricultural community reliant on cash economics (Jalan and Ravallion 2001). Most households rely strictly on agriculture of grapes, some walnuts, and forest products for their primary income, which being limited in diversity, may make adapting to new agricultural technologies and methods difficult with resettlement (Ponseti and López-Pujol 2007; Chen 2008; Tilt, Braun, and He 2009). Some households have indeed branched out, but this is limited to a few families.

In addition to having to adapt to new agricultural practices, a loss of forest products and caterpillar fungus could be detrimental to Geze's household economics. This is the village's second most important income source after grapes, and considering the fact that prices and demand for it show no slowing among China's middle class, it does not appear villagers' ability to make money from caterpillar fungus will diminish in the near future, except in the case of relocation. While it is true that the overall sustain-

ability of continued caterpillar fungus collection across the Himalaya has recently been questioned (Olsgard Stewart 2009; Winkler 2009), villagers in Geze reported no observable decreases in production in recent years, though they did indicate that each individual household has collected less in recent years but only because more people have been collecting, not because less is available.

Despite these indications, there is one area where Geze's villagers appear well adapted to cope with the socioeconomic shocks of resettlement. This is social cohesion, one of seven socioeconomic indicators identified and utilized by the Integrative Dam Assessment project (Brown et al. 2009; Tullos et al. 2013). During my time in Geze, I witnessed very strong social networks, especially with respect to the sharing of agricultural labor, which Tullos et al. (2013) identify as an important coping mechanism for dam induced displacement. While taking part in a variety of agricultural activities, I was able to witness strong bonds between households as they all consider themselves to be relatives of each other. One family neighboring my host household relied heavily upon other villagers' assistance in the harvest and other activities as they only had one young son and a father who was ill with diabetes and could not conduct any rigorous labor. This created a sense of angst and worry in the mother over the family's future and ability to survive off of agriculture. However, when it came time to harvest, several other villagers were happy to provide the assistance needed.

Conclusion

The importance of cash cropping and forest products, especially caterpillar fungus, has been demonstrated quantitatively based upon income figures and also by the strong perceptions of villagers. This importance has increased over time as capitalist markets have developed and allowed villagers to carve out a niche as producers, collectors, and sellers. However, commodification and marketing of such resources has reached a point of being Geze's only consistent and village-wide source of economic output. Because of this potential overreliance, villagers may now find themselves in a position of significant vulnerability if they are resettled, with consequences that have the potential to be highly damaging economically. With this impending perturbation, certain households have pursued other income strategies that may help to make them less vulnerable and also strong social bonds and labor sharing networks were also observed that should help to mitigate resettlement's effects. But what else can occur at a community level and/or a government/policy one to make Geze and villages like it more resilient?

Looking to the Future

The resettlement law of 2006 described in previous sections is a reason for optimism. Most of the literature on dam-induced displacement in China focuses on the Three Gorges Region, where over one million people were re-located. However at that time, the 2006 law did not exist, and in most cases there was no place for public participation. Admittedly, however, in the case of Three Gorges, China's government has since acknowledged that there have been many inexcusable social and environmental costs associated with the project despite its benefits (Central Government of the People's Republic of China 2011). Despite the rapid pace at which hydropower is being pursued in China, a certain amount of introspection towards how these projects are carried out appears to be occurring.

As a researcher I am not an opponent or proponent of hydropower, but as someone studying its social effects, I think it is worth weighing the costs of such projects to attempt to find the most equitable outcome and benefits for as many parties as possible. Even the World Commission on Dams recognized the value that dams have had as tools of social and economic development (World Commission on Dams, 2000). There is no simple answer as to whether building dams is a good method of development, but rather the way in which this is done must be examined from a critical perspective.

In addition to recent official recognition of the social impacts of dams in China (Central Government of the People's Republic of China 2006; Central Government of the People's Republic of China 2011), the activity and ability of grassroots movements and civil society have begun to play a role in hydropower (Mertha 2010). These actions have now begun to remove the one major barrier to resilience in China's river basins described by McNally, Magee and Wolf (2009), which has been a lack of local participation.

Recommendations for Resilience

The primary missing component in Geze's capacity to adapt to resettlement is a lack of knowledge among villagers of this potential perturbation. Geze is highly reliant on its location for villagers to live relatively well, and with what they deem to be a good standard of living. However, this does not mean that resettlement and loss of caterpillar fungus access and collection, along with the production of grapes, would necessarily be detrimental if better adaptive capacity were created.

The first necessity would be to ensure that villagers play an active role in the resettlement process, something stipulated by law. According to Chinese law, villagers must be

adequately informed of government plans and be allowed to play a role. Specifically, according to the 2006 resettlement law, public meetings in which villagers are both informed about resettlement plans and asked to provide their own input and concerns, which must then be taken into major consideration, are required in any hydropower relocation project (Central Government of the People's Republic of China 2006; Brown and Xu 2010). So far however this has only happened in resettlement projects to a very limited degree, and those who have been resettled expressed that they did not feel adequately recognized in the planning process (Brown and Xu 2010).

Perhaps the greatest concern that must be addressed with respect to Geze's resettlement is the loss of access to caterpillar fungus. While the resettlement law states that agricultural communities must not lose any source of livelihood or must have this maintained through compensation, it is not difficult to expect that this refers only to officially reported income. Caterpillar fungus is not an official source of income in government calculations, so it could easily be left out of resettlement compensation programs. With caterpillar fungus being one of Geze's two primary income sources, and a highly lucrative one, this is an issue that must be adequately addressed. In this respect, villagers were very good at articulating the importance of caterpillar fungus as important for their wellbeing and also an item that defined both their quality of life and the importance of the local landscape within which they live. If they were given free voice and allowed to play an active role in their resettlement, this fact could be addressed. If policies are followed correctly, or if they are made to correspond with and compensate for the informal economy, the loss of grapes in this case may not be as detrimental as caterpillar fungus, as these are at least partially recognized as an official source of income by the local level government.

Greater Implications

Villagers are indeed highly reliant on the money produced from caterpillar fungus, grapes, and other resources to live a quality life, and appear to be vulnerable to economic hardship without these income sources. Geze's location is a highly relevant issue; not only making it vulnerable to resettlement due to a potential lack of access to various natural resources, but also because villagers in fact see themselves as living in one of the richest and most abundant villages in the area in terms of the income bearing resources that are available.

So what does this say about the broader implications of Geze's vulnerability as a case study and with respect to

similar hydrodevelopment schemes across the Himalaya region, where such projects continue to expand at a rapid pace? As described in the introduction, many have studied and analyzed local knowledge about natural resources, processes, and their management, but it seems few have translated these studies into specific definitions and analyses of where potential vulnerabilities to large scale development might exist.

If a government were to ask a local community about their income and livelihoods and in what ways they utilize local natural resources to live and make an income, they might be very surprised by the results. Caterpillar fungus for instance is something highly desired by the Chinese and consumed by them at ridiculously high prices, however it is doubtful that any government planner involved in hydrodevelopment would have any idea that one of Geze's primary income sources is caterpillar fungus. This indicates that it is precisely this type of research that can help governments and other organizations find ways to better mitigate vulnerability of local economic livelihoods to large development programs.

I have previously been asked with respect to my assertions in this research over the importance of rural place based economies if 'money' can be translated as resilience. More specifically, the question here has been whether simply giving resettled populations currency or the opportunity at new business opportunities would be adequate to solve the ill effects of their displacement. While on the surface the answer to this question based upon my results might appear to be yes, my overall belief, particularly as an anthropologist and an ethnographer, is no. Elsewhere (see Galipeau 2012), I have shown that one of the particularly pertinent issues faced by Geze's villagers is that they not only have a highly place-based economy, but also a place-based culture and cultural practices, which things like caterpillar fungus are indeed a part of in addition to being market commodities; these things are a part of their village identity. Villagers continually describe how fortunate they are to live in a region with a mountain that is rich with resources, not just for markets, but also for their daily life needs and spiritual beliefs, which others have also commented on the importance of with regards to the landscape of the upper Mekong (Salick and Moseley 2012; Yin 2012). While I have focused on socioeconomics in this paper, there is still a much broader holistic view towards what quality of life meant as villagers expressed it to me that demonstrates in terms of socio-cultural values, money can in no un-simplified way translate as resilience.

To close, returning to the idea of quality of life and economic wellbeing, all but one household told me that their standard of living was better today than five years ago. With this being true, and with many members of Chinese society indicating their life is better today than in previous decades, a major detriment to this success would be to force villages like Geze in China or elsewhere into a lower standard of living than what they have come to experience. When the quality of life in even rural China has reached arguably unprecedented levels, what becomes disheartening is to see these same rural communities lose this success in the name of further developing the nation as a whole. We have seen the negative social effects of dams and resettlement across the region multiple times, but it does not mean that they need to continue. As long as development can work towards determining a way to holistically take into account the opinions and values of local communities, such projects can be used as an effective means of development for the betterment of society.

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Endnote

1. A *dzo* is a cross between a yak and a cow. These are far more common in Northwest Yunnan than true yaks because they can survive at much lower elevations than yaks but still provide the same abundance of dairy, meat, and other resources. As Geze is located at around 5,000ft in elevation in a valley bottom, *dzo* are certainly a better choice.

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